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LIFE OF CAST IRON PIPE IN PHILADELPHIA

The report of the Committee on Depreciation[1] states that large cast iron pipe, kept clean and well maintained, has a life based upon "the possible changes in public need, functional usefulness and the burden of a reasonable amortization," and it suggests from seventy-five to one hundred and twenty-five years as a suitable range to adopt provisionally. In the case of small cast iron pipe a range of thirty to seventy years is suggested because of the increased difficulty in cleaning and maintaining small pipe, their removal on account of insufficient capacity for increased needs or the necessity of reinforcing them with additional pipe lines for the same reason. The experience in Philadelphia confirms these opinions and throws some light on early experience in using cast iron pipe which is interesting historically. Nothing has yet occurred to indicate that under normal conditions a limit can be placed upon the useful life of cast iron pipe in this city.

The first cast iron water pipe in Philadelphia was laid in 1817. It was flange pipe, imported from England. It was in continuous service until 1914, a period of ninety-seven years, when it was replaced by larger pipes in anticipation of street repavement. It was in good condition when taken up and had evidently by no means approached the limit of its useful life, except through obsolescence. Soon after it was laid a transition from flange to bell-and-spigot pipe occurred which is discussed in some reports of that time as follows:

> In their last report the Committee stated that they had written to London for information and had ordered a parcel of various size pipes fitted in a manner which experience had pointed out as best, and they have through the diligence and care of an engineer of the first respectability obtained some very useful information contained in two reports herewith submitted, and a number of pipes constructed upon such principles as will insure strength and prevent leaks at joints, and the Committee are decidedly of the opinion that they can be laid down at first cost at as low a price per foot as wooden pipes of the same diameter. (Report of Watering Committee, November 11, 1818.)
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> Under every consideration perhaps it is well that the fourteen-inch iron main had not been put down as the experienced deficiency of water proved that it would have been too small, its area being 153 inches and rather less than the six ranges of wooden pipes now laid; and the method at that time in use of putting iron pipes together with flanch joints would in all probability have defeated the object by the leakage in that sort of pipes. The same incon-

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[1] JOURNAL, March, 1919, page 103.

> venience under which we now labor took place at the New River Water Works in London; and although they had fifty mains of seven-inch bore, still for want of a sufficiency of water they were compelled to abandon them and substitute large iron mains some of which were thirty inches diameter; they are cast with the common spigot and fauset joints. (Report to the Watering Committee late in 1818 by Frederic Graff, Superintendent of the Water Works, who later became the fifteenth president of the American Society of Civil Engineers.)

Five years later there was considerable criticism of the Committee for using imported pipe and it issued a statement to the effect that the greater part of the pipe already laid or on hand was made in the United States and none was imported when supplies could be obtained here except as samples for the benefit of American manufacturers. In 1823 the Committee reported the following details of the pipe and its use:

> The straight pipes are made in lengths of nine feet with what are called spigot and faucet joints; other pipes of a circular form, to pass round corners, are made of different lengths, as may be required, with easy turns, by which it is obvious the passage of water is much facilitated.
>
> The laying of the pipes is very easy, care being taken to keep them firm in their bed—the hub, or large end of one, laps about 4 to 6 inches over the small end of the other, leaving a space of from ¼ to ½ inch all around, which is first caulked in with a ring of plaited hemp to prevent the lead running into the pipes; then a pair of nippers with a joint in the lower part, to fit all around the pipes, and having an opening on top for the lead, and another for the escape of the air, is affixed next to the opening on the outer part of the pipe, so as to prevent the lead coming out in front, which is further secured by a ring of clay, outside of the nippers, and formed into a cap at top, into which melted lead is poured, forming a ring of lead 3 or 4 inches in depth. When the lead is cold the clay and nippers are removed and it is then upset with a hammer and chisel, which completes the joint.

A line of this old pipe which was laid in 1827 was removed in 1915 during subway construction. It was in excellent condition after eighty-eight years of service but was not relaid because a main of larger capacity was desirable. Several hundred feet of 30 inch pipe laid in 1850 were taken up during 1918 to facilitate parkway construction and found to be in such satisfactory condition that after being cleaned they were relaid.

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